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SPECIFICATION

ELECTRICAL CONNECTOR WITH ACCURATE MEASURING BENCHMARKS

BACKGROUND OF THE INVENTION

1. Field of the invention

[0001] The present invention relates to an electrical connector for electrical connecting an electronic package such as an integrated circuit (IC) chip with a circuit substrate such as a printed circuit board (PCB), and particularly to a connector adapted for receiving a land grid package (LGP) therein and electrically connecting the LGP with a PCB.

2. Description of the prior art

[0002] Land grid array (LGA) connectors for connecting a Land Grid Package (LGP) with a printed circuit board (PCB) are widely used in the field of electrical connectors.

[0003] Referring to FIGS. 6-7, a conventional Land Grid Array (LGA) connector is illustrated. The LGA connector 6 comprises an insulative base 50 mounted on a printed circuit board (not shown), a metal clip 51 pivotably engaged on one end of the base 50, and a lever 52 engaged on an opposite end of the base 50 for fastening the clip 51 onto the base 50. The base 50 is substantially rectangular. A floor 502 is defined in a middle of the base 50. A rectangular raised support area 501 is provided around a periphery of the floor 502. The support area 501 defines four inner side walls 503. The side walls 503 and the floor 502 cooperatively define a substantially rectangular cavity therebetween. A plurality of passageways is defined in the floor 502, for receiving a corresponding number of electrical contacts (not shown) therein. Examples of this kind of electrical are disclosed in US Pat. Nos. 4,504,105, 4,621,884, and 5,302,853.

[0004] In manufacturing, the size of the cavity is determined by the size or type of an LGP 7. Commonly, the side walls 503 of the cavity loosely contact corresponding side edges of the LGP 7 when the LGP 7 is mounted in the cavity, thereby preventing the LGP 7 from being displaced to an incorrect position. Therefore, it is very important to measure the cavity accurately for the purposes of quality control prior to the connector being mounted on the printed circuit board. In practice, the side walls 503 are usually used as benchmarks for such measuring.

[0005] However, one problem with this type of electrical connector is that warpage of the support area 501 is very common in manufacturing of the base 50. This bends the side walls 503, as shown with broken lines in FIG. 7. Therefore, the warped side walls 503 cannot be used as benchmarks for measuring, and it is problematic to accurately measure the cavity.

[0006] In view of the above, a new electrical connector which overcomes the above-mentioned disadvantages is desired.

SUMMARY OF THE INVENTION

[0007] Accordingly, an object of the present invention is to provide an electrical connector that allows accurate benchmarks for measuring a cavity of a base thereof to be obtained, even if the base is warped during manufacturing.

[0008] To achieve the above-mentioned object, an electrical connector in accordance with a first embodiment of the present invention comprises an insulative base mounted on a printed circuit board, a metal clip pivotably engaged on the base, and a lever for fastening the clip onto the base. The base is substantially rectangular. A floor is defined in a middle of the base. A rectangular raised support area is provided around a periphery of the floor. The support area defines four inner side walls. The side walls and the floor cooperatively define a substantially rectangular cavity therebetween. One of the side walls defines a pair of protrusions with inner surface extending into the cavity, wherein the inner surfaces of the two protrusions are parallel to the side wall, and are coplanar with each other. The other three side walls each define a single protrusion extending perpendicularly therefrom.

[0009] Therefore, a first benchmark is obtained by a line joining the inner surfaces of the pair of protrusions on the side wall, and a second benchmark is then obtained by a line joining the first benchmark A and the inner surface of the single protrusion on an adjacent perpendicular side wall. In addition, further embodiments of the present invention are disclosed.

[0010] Other objects, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is an isometric view of an electrical connector in accordance with the first embodiment of the present invention, together with an LGP ready to be mounted in a cavity of a support area of the electrical connector;

[0012] FIG. 2 is a top plan view of the LGP mounted in the cavity of the support area of the electrical connector of FIG. 1;

[0013] FIG. 3 is an isometric view of an electrical connector in accordance with a second embodiment of the present invention, together with an LGP ready to be mounted in a cavity of a support area of the electrical connector;

[0014] FIG. 4 is a top plan view of the LGP mounted in the cavity of the support area of the electrical connector of FIG. 3;

[0015] FIG. 5 is a top plan view of an LGP mounted in a cavity of a support area of an electrical connector in accordance with a third embodiment of the present invention;

[0016] FIG. 6 is an isometric view of a conventional electrical connector, together with an LGP ready to be mounted in a cavity of a support area of the electrical connector; and

[0017] FIG. 7 is a top plan view of the LGP mounted in the cavity of the support area of the electrical connector of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

[0018] Reference will now be made to the drawings to describe the present invention in detail.

[0019] Referring to FIGS. 1-2, an electrical connector 1 in accordance with the first embodiment of the present invention comprises an insulative base 2' mounted on a printed circuit board (not shown), a metal clip 3 pivotably engaged on one end of the base 2', and a lever 4 engaged on an opposite end of the base 2' for fastening the clip 3 onto the base 2'. A Land Grid Package (LGP) 5 is disposed between the base 2' and the clip 3, for connecting with the printed circuit board via the connector 1.

[0020] The base 2' is substantially rectangular. A floor 232' is defined in a middle of the base 2'. A rectangular raised support area 23' is provided around a periphery of the floor 232'. The support area 23' defines four inner side walls 231'. The side walls 231' and the floor 232' cooperatively define a substantially rectangular cavity 230' therebetween. A plurality of passageways is defined in the floor 232', for receiving a corresponding number of electrical contacts (not shown) therein.

[0021] A pair of separated protrusions 2310' extends perpendicularly from one side wall 231' into the cavity 230'. Each protrusion 2310' is parallelepiped-shaped, and defines an inner surface 2312' parallel to the side wall 231'. The inner surfaces 2312' are coplanar. The other three side walls 231' each have a single protrusion 2310' extending perpendicularly therefrom. All the protrusions 2310' of the side walls 231' cooperatively define a receiving room in the cavity 230', for receiving the LGP 5 therein.

[0022] In use of the connector 1, the LGP 5 is disposed in the receiving room between the protrusions 2310' of the side wall 231'. The clip 3 is rotated downwardly to a horizontal closed position, and the clip 3 is fastened to the base 2' by the lever 4.

[0023] In measuring, a first benchmark A can be easily obtained by a line joining the inner surfaces 2312' of the two protrusions 2310' of the same side wall 213', even if the side wall 231' has warped during manufacturing. Then a second benchmark B can be obtained by a line joining the first benchmark A and the inner surface 2312' of the protrusion 2310' of an adjacent perpendicular side wall 231'. In similar fashion, benchmarks of the other two side walls 231' can also be obtained by lines joining corresponding protrusions 2310'. Therefore, the receiving room for accommodating the LGP 5 can be easily measured, for the purposes of quality control prior to the connector 1 being mounted on the printed circuit board. It should be noted that the protrusions 2310' are relatively small compared to the side walls 231'. In addition, the two protrusions 2310' on the same side wall 231' are disposed far away from each other, and are equidistant from a midpoint of the side wall 231'. Therefore, any warpage of the side wall 231' has little effect on the inner surfaces 2312' of the protrusions 2310', and correspondingly little effect on the first benchmark A and the second benchmark B.

[0024] The LGP 5 may rotate in the receiving room of the cavity 230', as shown with broken lines in FIG. 2. This is especially the case if any gaps exist between the inner surfaces 2312' of the protrusions 2310' and corresponding edges of the LGP 5. Any rotation may adversely affect the connection of the LGP 5 with the printed circuit board.

[0025] FIGS. 3-4 relate to an electrical connector in accordance with the second embodiment of the present invention. A base 2'' comprises a supporting area 23'', and a substantially rectangular cavity 230'' is defined in a middle of the supporting area 23''. The cavity 230'' is bounded by a sunken floor 232'' and four surrounding side walls 231''. A plurality of passageways (not shown) is defined in the floor 232'', for receiving a corresponding number of electrical contacts (not shown) therein. A pair of parallelepiped-shaped protrusions 2310'' extends from opposite ends of each side wall 231'' into the cavity 230''. In addition, two adjacent protrusions 2310'' at each of two adjoining side walls 231'' are integrally formed together to provide an L-shaped configuration. Inner surfaces of the protrusions 2310'' of each side wall 231'' are parallel to the side wall 231'', and are coplanar with each other.

[0026] In use, the LGP 5 is received in the cavity 230'', being disposed in a receiving room defined between the protrusions 2310''. Because the protrusions 2310'' are at ends of the side walls 231'', rotation of the LGP 5 in the cavity 230'' is effectively limited.

[0027] In measuring, a first benchmark A can be easily obtained by joining inner surfaces of two protrusions 2310' of any of the side walls 213'. In similar fashion, a second benchmark B and other benchmarks can also be obtained. Therefore, the receiving room for accommodating the LGP 5 can be easily measured.

[0028] FIG. 5 relates to an electrical connector in accordance with the third embodiment of the present invention. The third embodiment is similar to the second embodiment, except that a recess 2311 is defined in each corner of a supporting area 23''' where two adjacent protrusions 2310''' of two adjoining side walls 231''' are disposed. The recess 2311 can release stresses in the corner that form during manufacturing of the connector. This helps ensure reliable mechanical and electrical performance of the connector.

[0029] While preferred embodiments in accordance with the present invention have been shown and described, equivalent modifications and changes known to persons skilled in the art according to the spirit of the present invention are considered within the scope of the present invention as defined in the appended claims.